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Contract No. NAS 3-22498

(NASA-CR-174268) THE 20 GHz  
PROOF-OF-CONCEPT TEST MODEL RESULTS FOR A  
MULTIPLE SCAN BEAM DUAL REFLECTOR ANTENNA  
(Ford Aerospace and Communications Corp.)  
15 p HC A02/NF A01  
N85-15944  
Unclas  
CSCI 17B G3/32 13678

20GHZ PROOF-OF-CONCEPT TEST MODEL RESULTS FOR A  
MULTIPLE SCAN BEAM DUAL REFLECTOR ANTENNA

BY

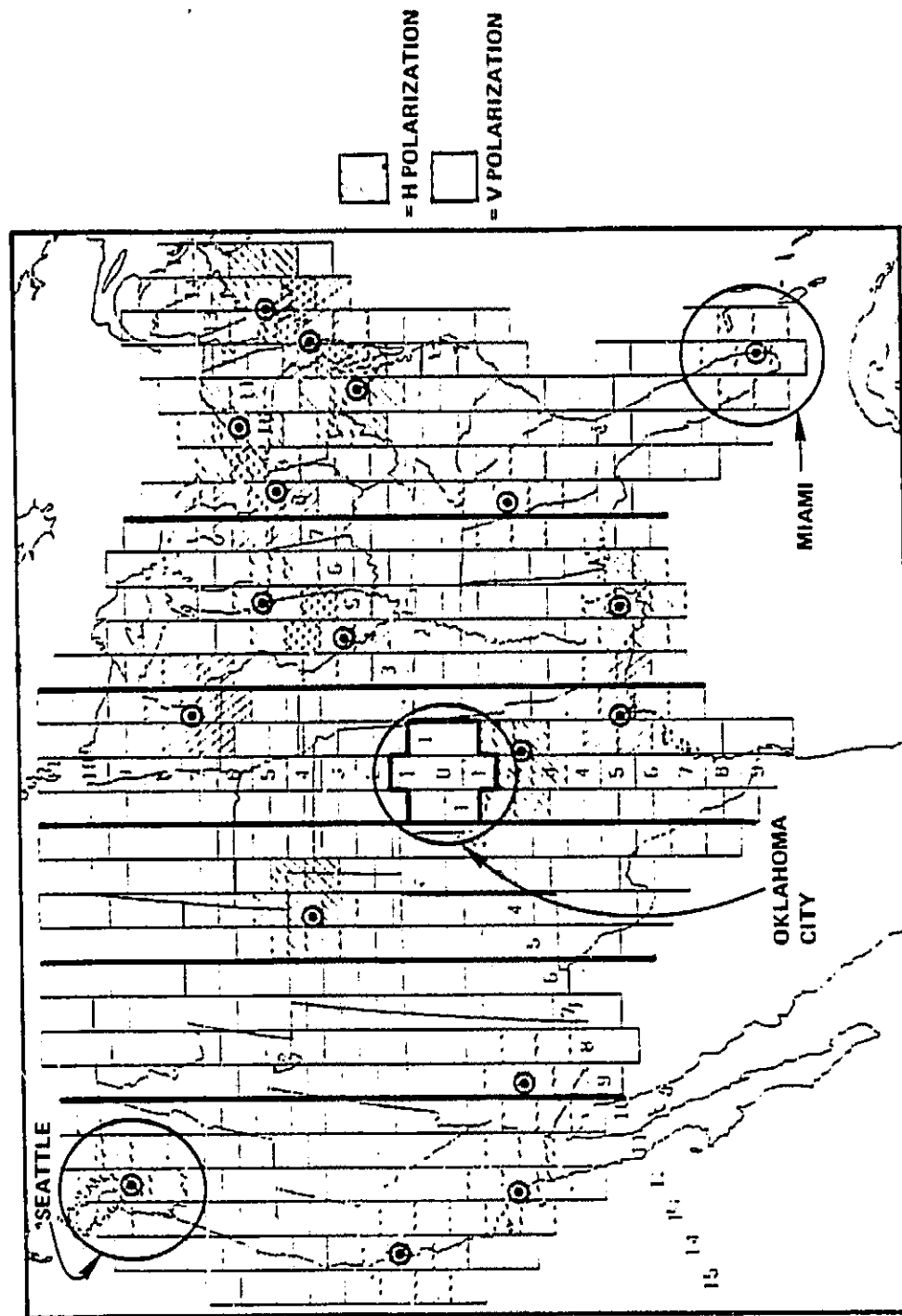
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FORD AEROSPACE & COMMUNICATIONS CORPORATION  
WESTERN DEVELOPMENT LABORATORIES  
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Propagation Symposium  
Houston, Texas  
May 23 - 27, 1983

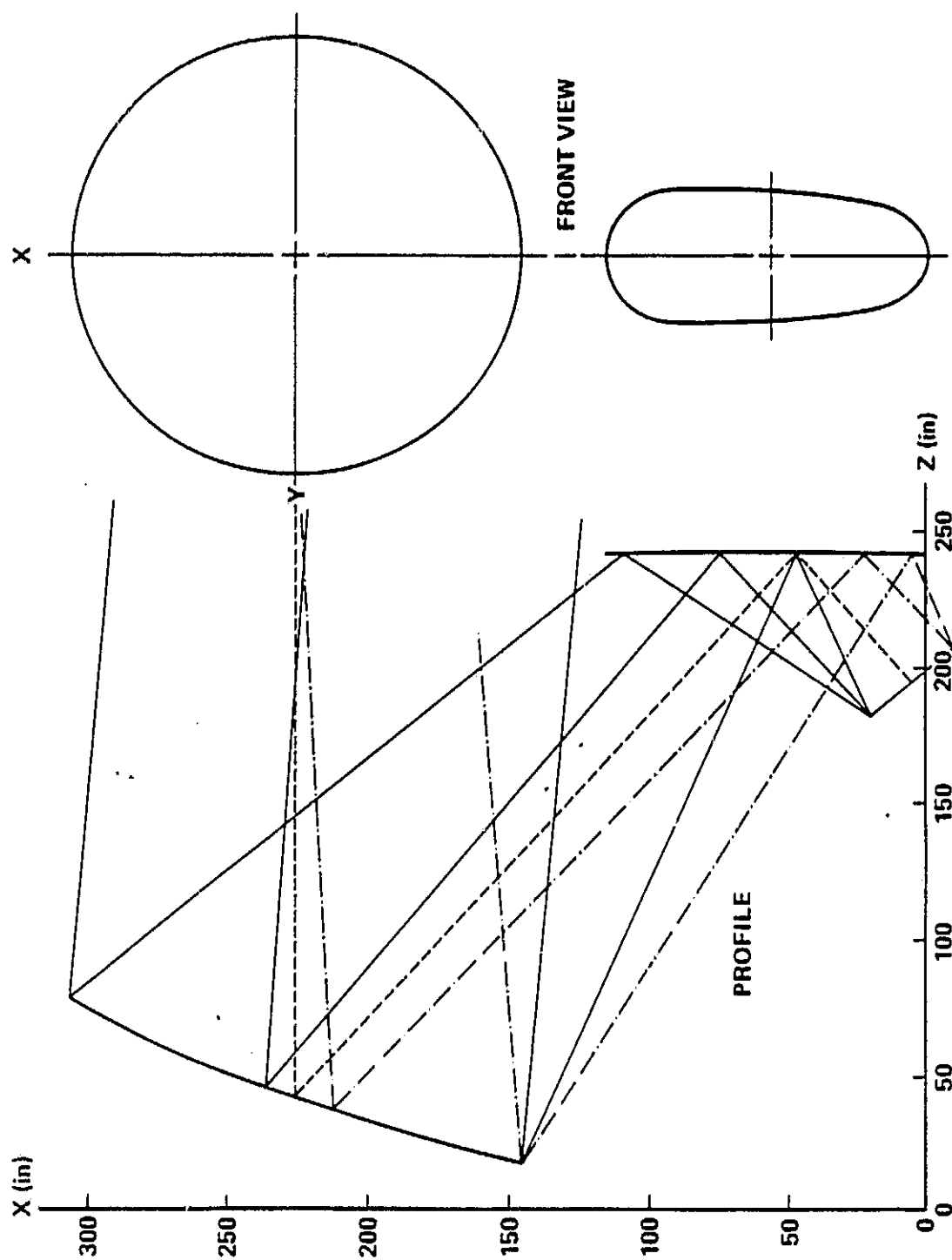
# ABSTRACT

Under Contract NAS 3-22498, NASA Lewis Research Center, we have designed, fabricated, and are testing a full scale 20 GHz antenna model. The model is intended to test the low side-lobe beam scanning capability of a new class of an offset dual reflector and feed array configuration. The offset main reflector and subreflector surfaces were custom shaped by a computer synthesis procedure. The optics so derived results in beam scan loss under 1 db over the  $\pm 12.3$  beamwidths by  $\pm 5.8$  beamwidths scan volume while maintaining low sidelobes. The preliminary test results indicate that the measured and computed patterns are in good agreement.

# CLUSTER EXCITATION FOR THREE BEAM POSITIONS IN CONUS FEED ARRAY



# NASA 30/20 GHz REFLECTORS AND FEED CONFIGURATION



## KEY FEATURES

### Shaped-Surface Cassegrain Reflector System

- Minimal ( 0.5 dB) gain loss over  $\pm 12$  beamwidths (0.3° of scan)
- Preservation of low sidelobes at wide scan angles ( 30 dB scan beam isolation)
- Development of antenna synthesis and analysis computer programs (including GTD)

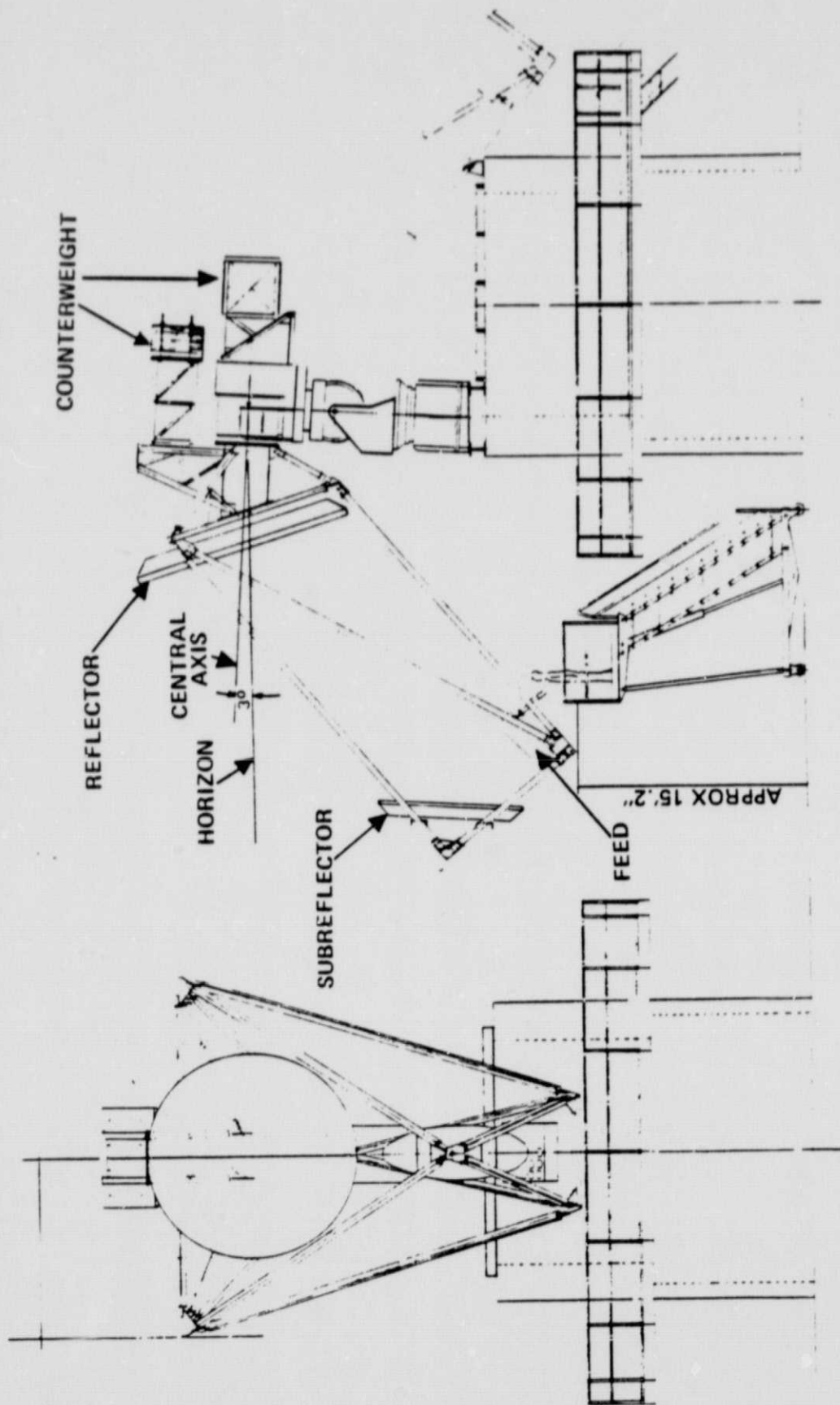
### Unique Beamforming/Switching Feed Networks

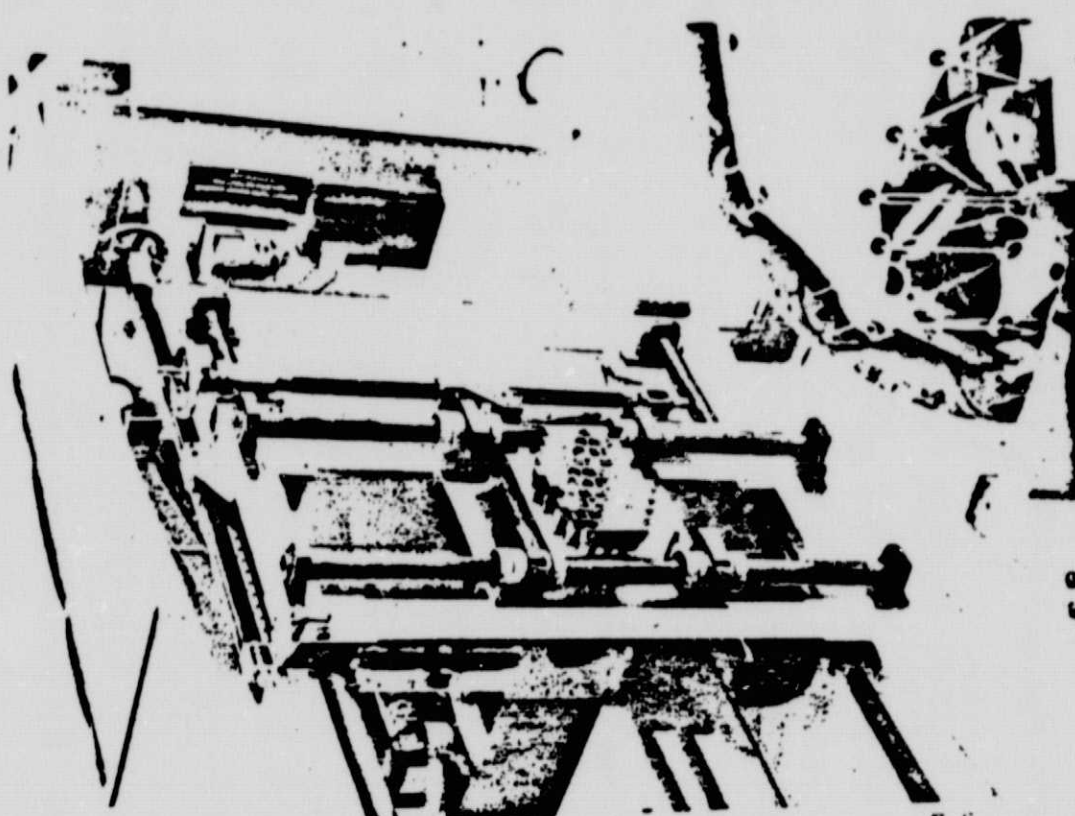
- Utilizes multi-element clusters to minimize cross-polarization and sidelobes
- Beam selection performed by variable power dividers and ferrite switches
- Fast switching time,  $< 6.0 \mu s$




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# POC MODEL MBA

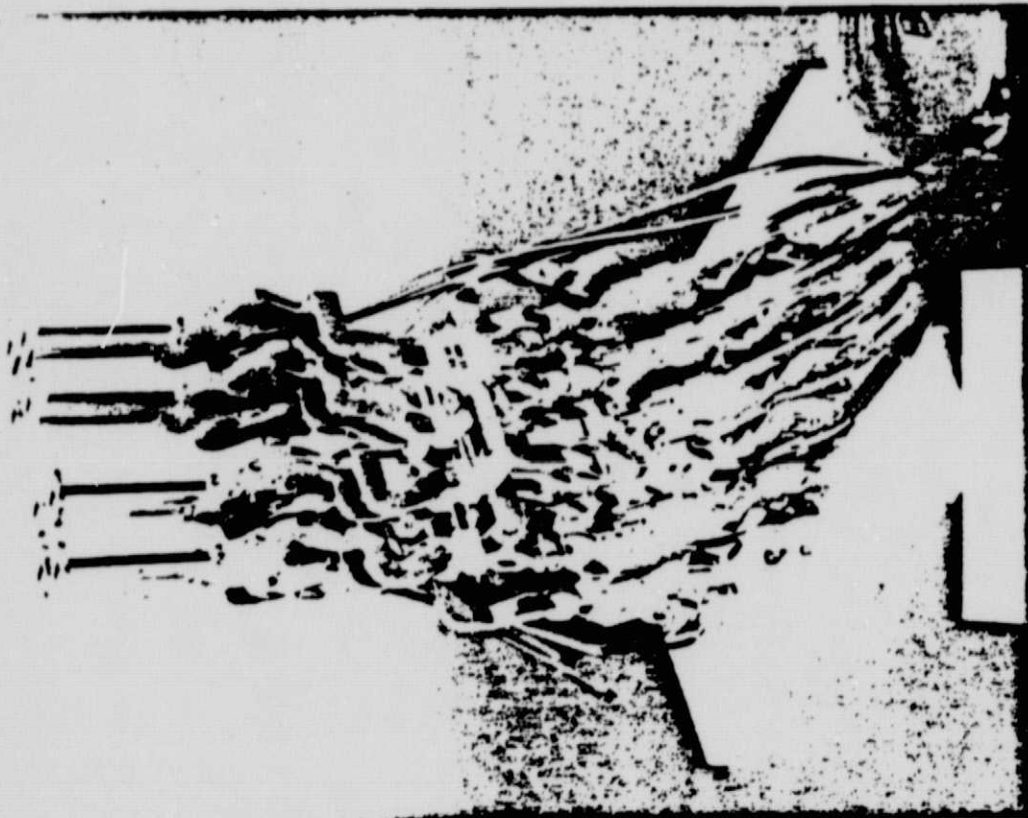





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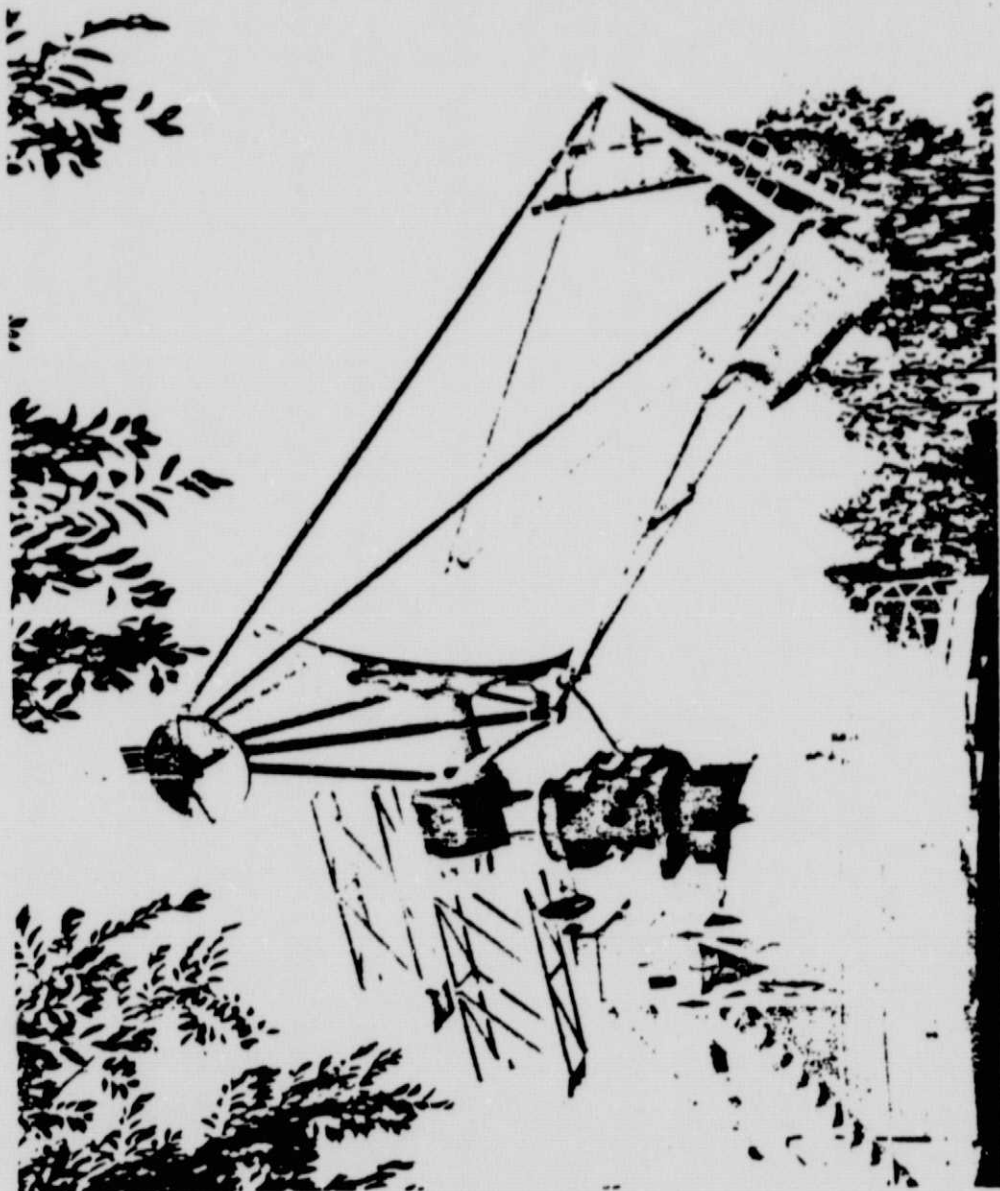
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




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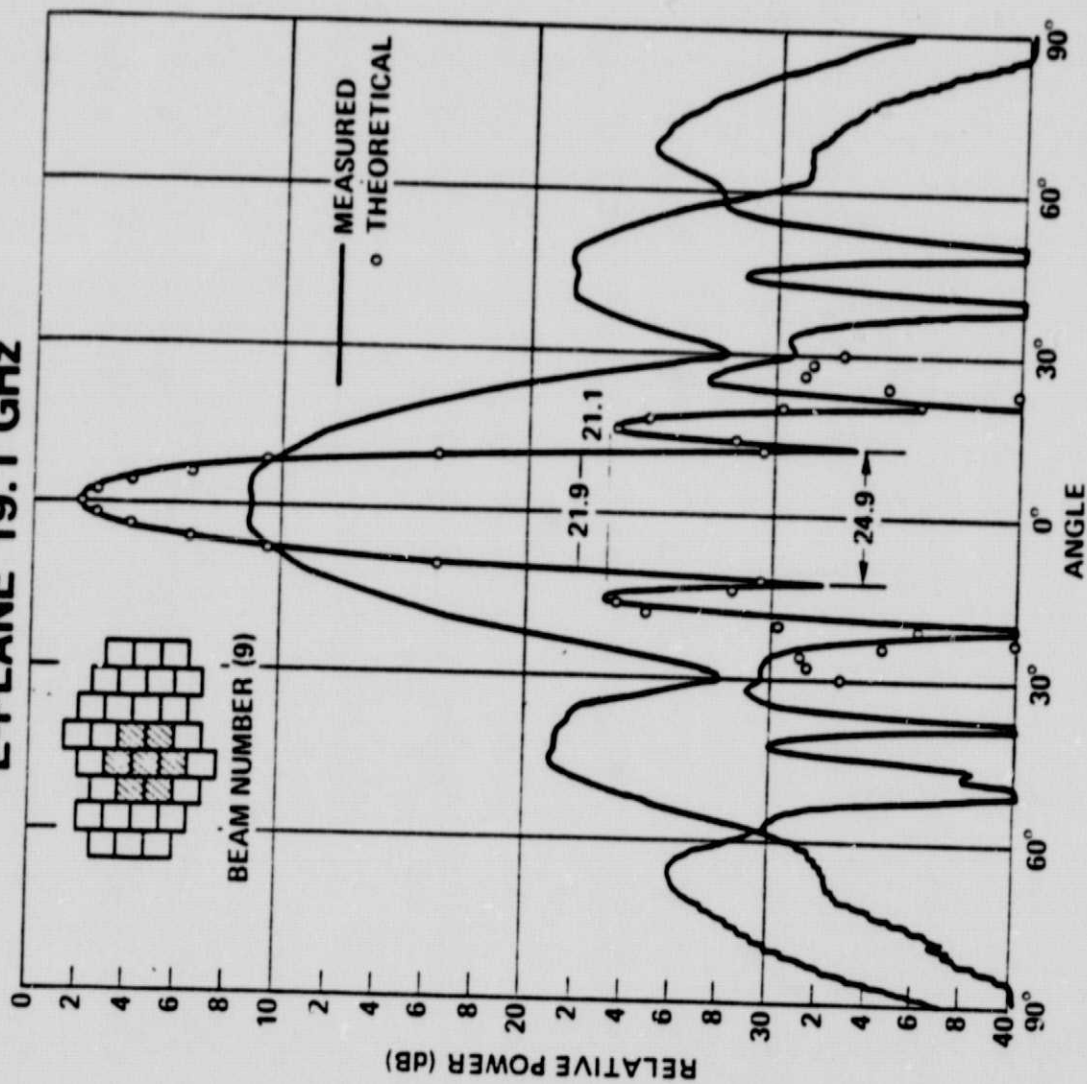
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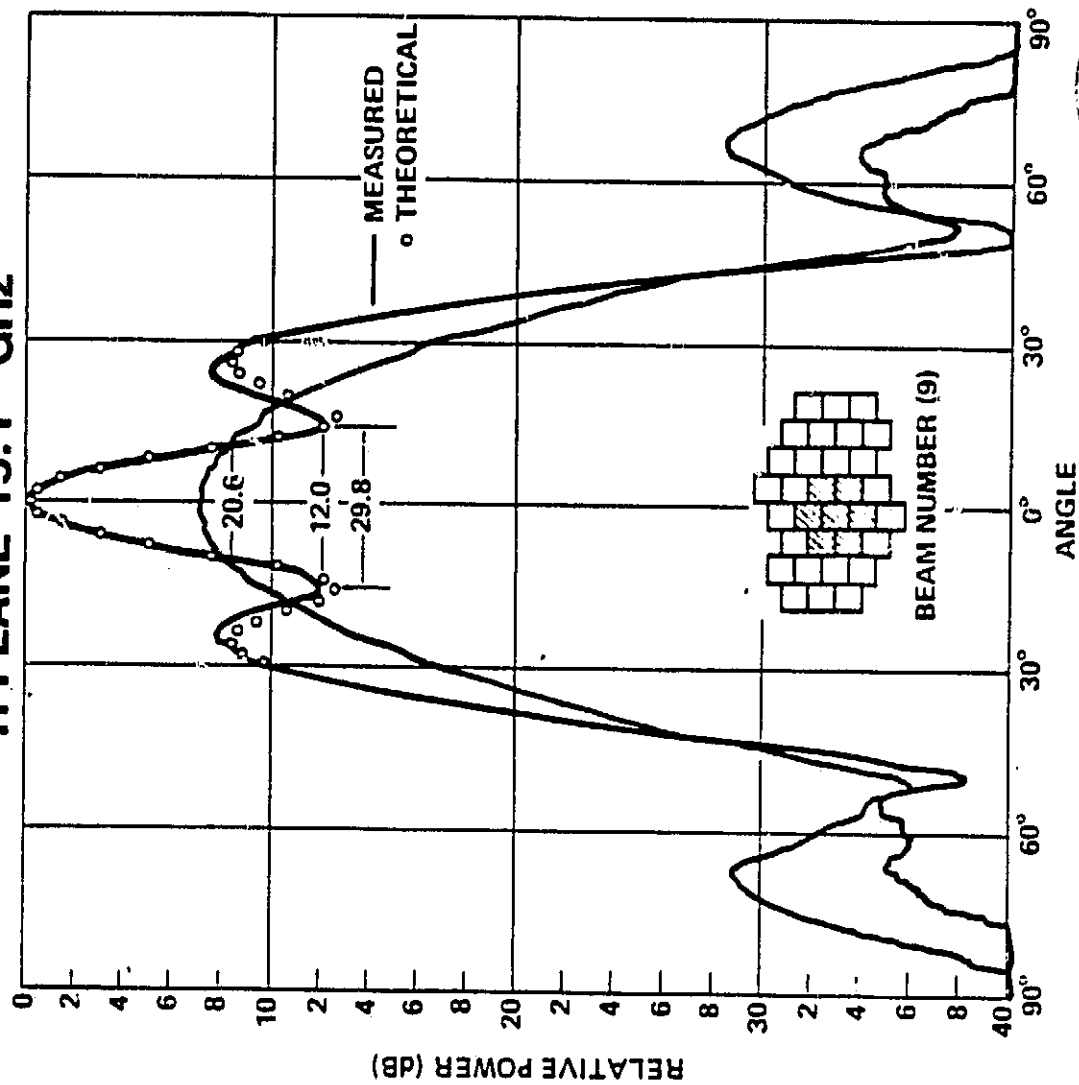
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# NASA 30/20 GHz SCAN BEAM PRIMARY PATTERN SINGLE AND 7-ELEMENT E-PLANE 19.1 GHz

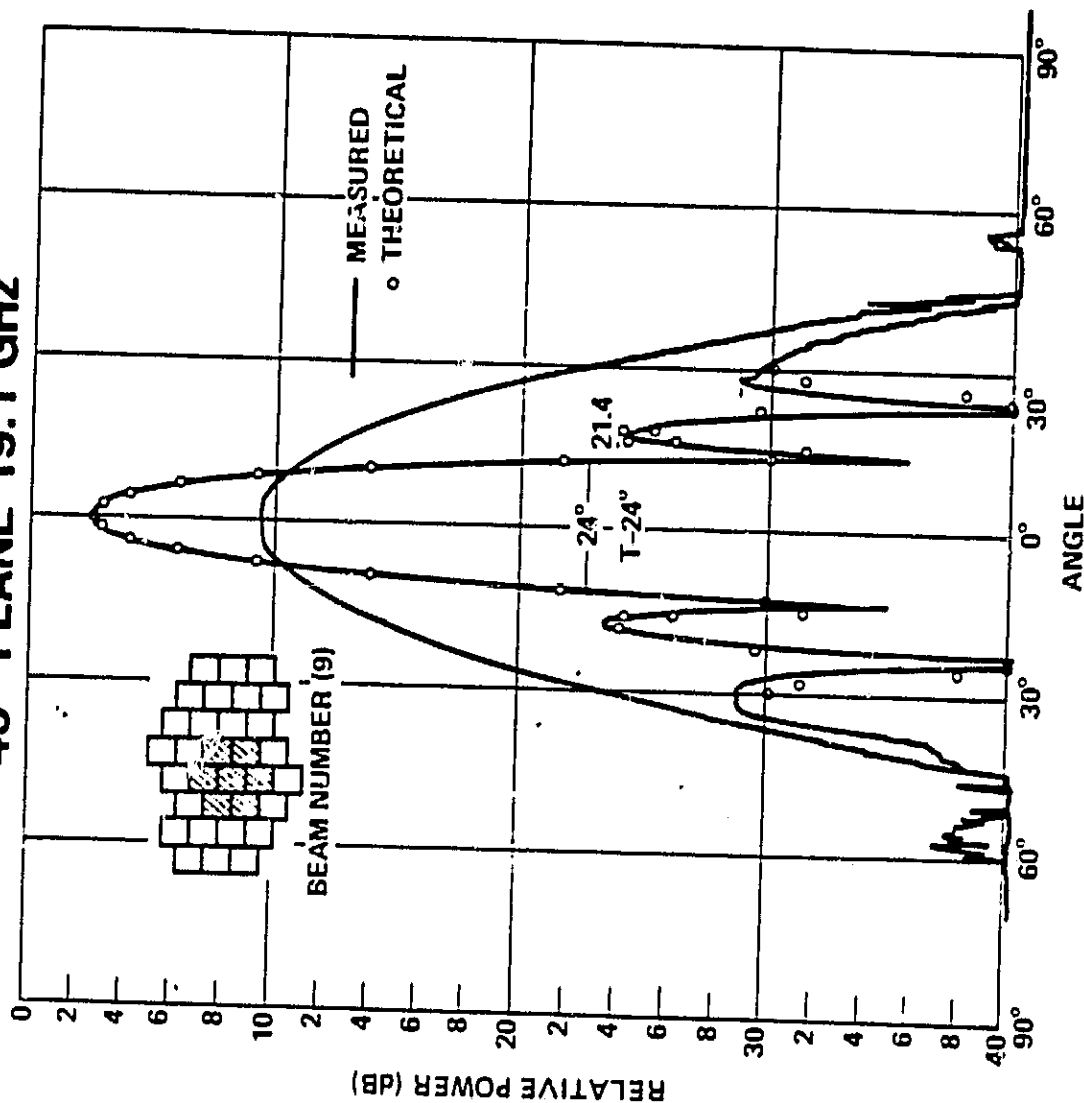


# NASA 30/20 GHz SCAN BEAM PRIMARY PATTERN SINGLE AND 7-ELEMENT

H-PLANE 19.1 GHz



# NASA 30/20 GHz SCAN BEAM PRIMARY PATTERN SINGLE AND 7-ELEMENT 45° PLANE 19.1 GHz



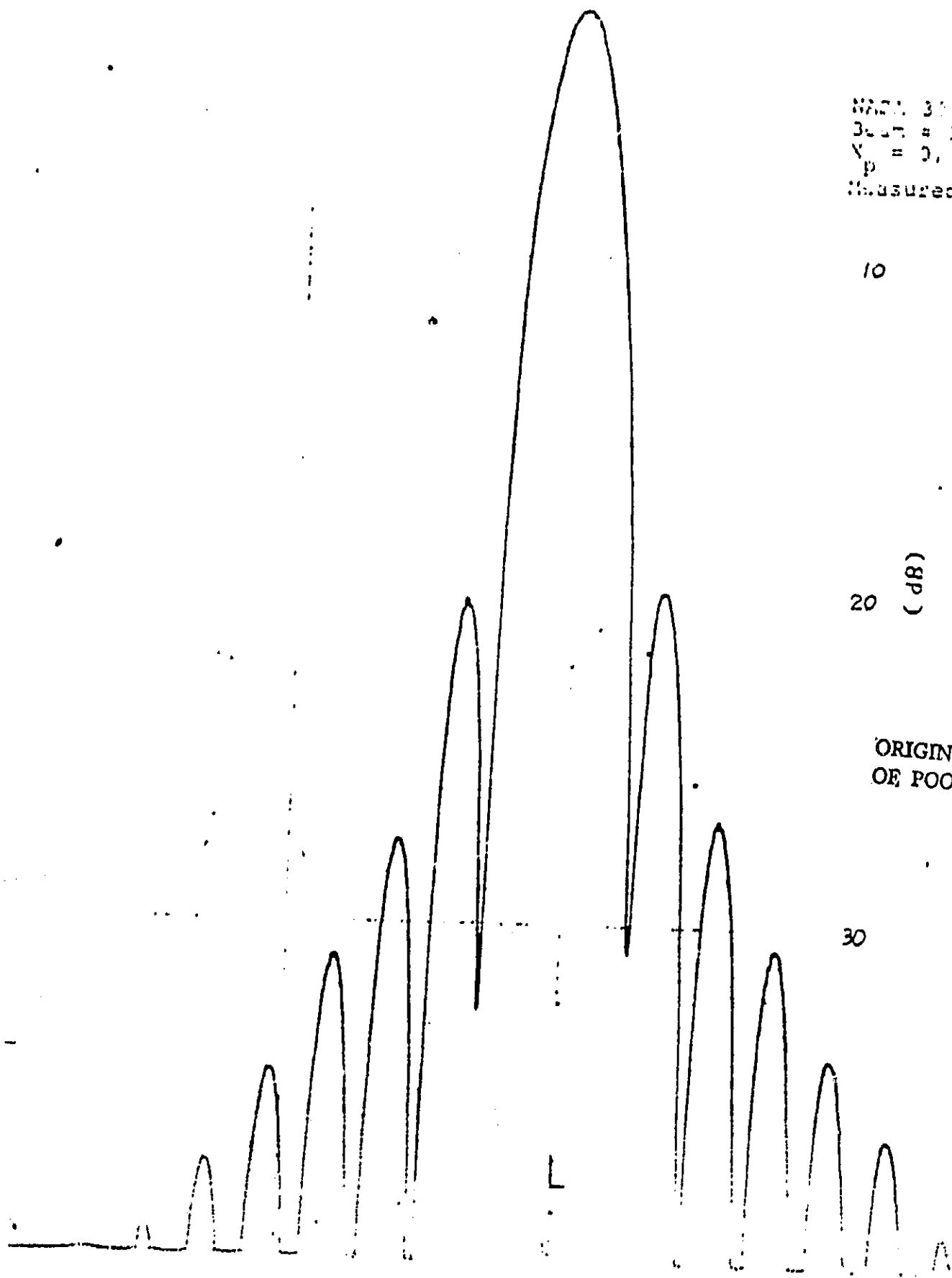
WASA 30 20 002 WSA  
3017 = 109  
 $V_p = 0, Y_p = 0$   
Measured AZ Pattern

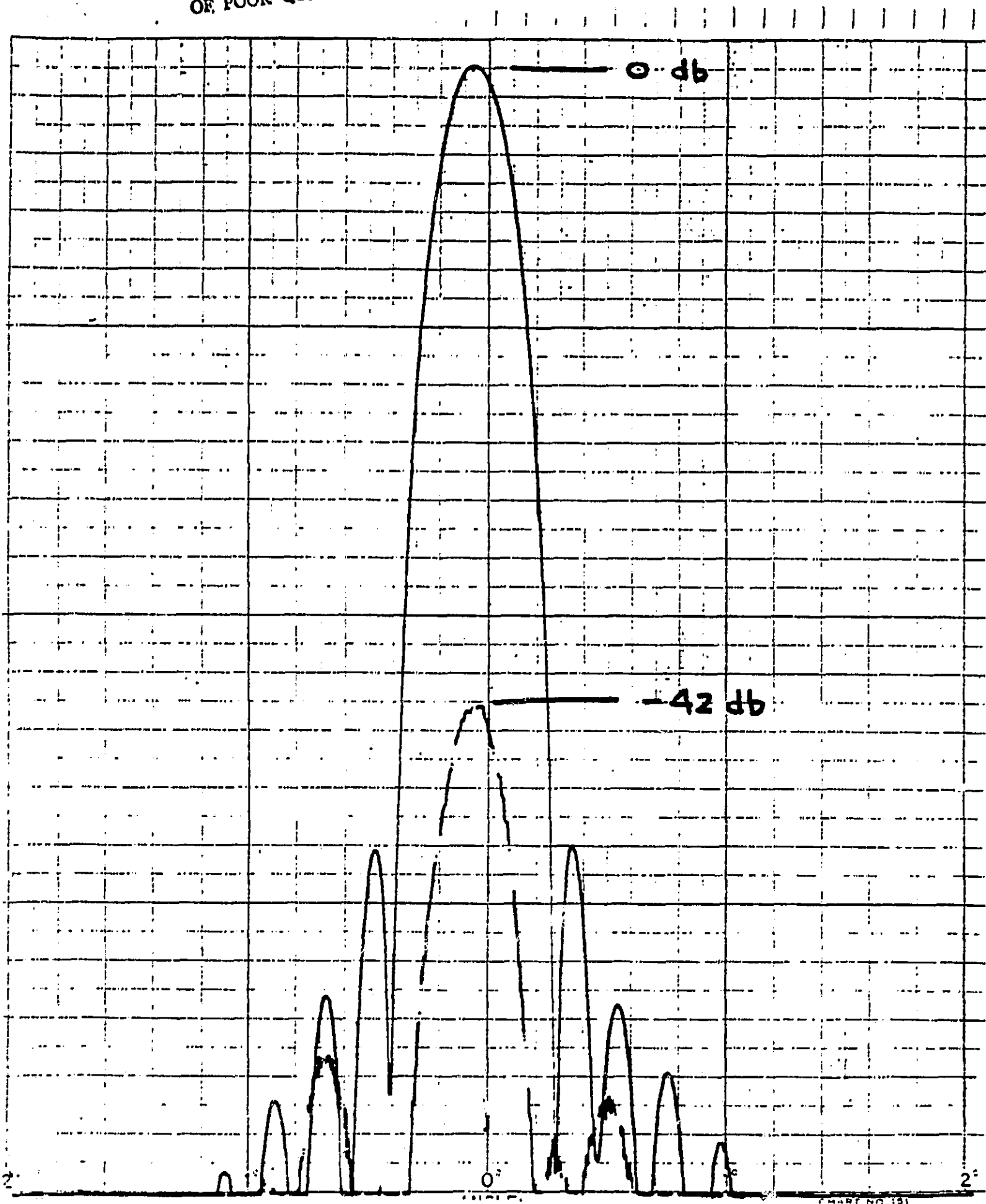
10

20 (dB)

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30





RELATIVE POWER (db)

— 0 db

— -42 db

2°

0°

ANGLE

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